the gametophyte of the latter, with its reduced number of chromosomes, finds its analogue merely in the maturing sexual cells of *Fucus*. But until we know more of the nuclear changes as they occur in other Algæ, and especially in the more primitive forms, it seems unadvisable to go further than to indicate the possibility that we may require to revise our present ideas on the comparative morphology of the higher and lower groups of the vegetable kingdom. Even if we regard the reduction in the number of the chromosomes as a fact which is primarily of physiological importance, we may safely conclude, from the universality of its occurrence, that it is also intimately connected with the phylenogenetic development of living forms, and hence it must meet with due recognition on the part of the morphologist who is engaged in comparing the life-history of one group of organisms with that of others.

"On certain Changes observed in the Dimensions of Parts of the Carapace of *Carcinus mœnas*." By HERBERT THOMPSON. Communicated by Professor W. F. R. WELDON, F.R.S. Received May 19,—Read June 11, 1896.

In making some measurements of young male *Carcinus mœnas* from Plymouth, corresponding to those made by Professor Weldon on young females of the same species, and published by him in the Report of a Committee for conducting statistical inquiries into the measurable characteristics of plants and animals ('Roy. Soc. Proc.,' vol. 57, p. 360), some interesting facts were observed as to changes taking place in the relative dimensions of certain parts of the carapace of these crabs in the space of the last three years.

The carapace of the adult male crab, measured in the median antero-posterior line is, roughly, from 40 to 60 mm. long. Now, of young male *C. mœnas* collected at random at Plymouth in the year 1893, I had, for the purposes of measurement, 3,077 specimens, ranging between 10 and 15 mm. in length of carapace, and on these, besides the carapace length, as above defined, two other measurements were taken, viz. (1) "frontal breadth," the distance in a straight line between the tips of the two teeth which form the outer boundaries of the orbits, and (2) the "right dentary margin," measured in a straight line from the tip of the first to that of the last lateral tooth on the right side of the carapace.

The measurements were made in the way described in the Report above mentioned (*ibid.*, pp. 361—2): and owing to the rapid growth and alteration of proportional dimensions in the young crabs, they were sorted into groups, the members of each of which differed by less than 0·2 mm. in carapace length, thus giving five groups for

every 1 mm. of growth in carapace length, or twenty-five groups for the whole range of 10—15 mm. carapace length. The numbers contained in the separate groups ranged from seventy-two in the smallest group to 178 in the largest group. The arithmetical mean and mean error in each group is set out in Table I *infra*.

Similar measurements were made in the case of 1,957 young male *C. mœnas* from Plymouth of the year 1895. These were likewise divided into groups differing by 0·2 mm. of carapace length: and the numbers contained in the twenty-five groups between 10 and 15 mm. carapace length ranged from thirty-four in the smallest one to 111 in the largest. The arithmetical means and mean errors are given in Table I *infra*.

On comparing the two sets of measurements (expressed in terms of the carapace length which was taken as the unit) it appears, as regards the "frontal breadth," that in every one of the twenty-five groups without exception the average size of the frontal breadth in the 1893 crabs exceeded that of the 1895 crabs of corresponding size. Seeing how small the groups are the result is a striking one, and is given in greater detail in the following Table:—

C. mœnas.—Frontal Breadth.

Carapace length in millimetres.	Average excess of 1893 crabs over 1895 crabs.	
	In thousandths of carapace length.	In millimetres.
10—11	6·30	0·07
11—12	7·29	0·08
12—13	6·73	0·08
13—14	5·26	0·07
14—15	3·53	0·05

On the other hand, if the species in 1895 has a smaller average frontal breadth, it compensates for the deficiency by having a larger right dentary margin. This was found to be the case in twenty-three out of the twenty-five groups, the two non-conformist groups lying one near each end of the range. The arithmetical means and mean errors are given in Table I *infra*, and the results, tabulated in a corresponding form to those of the frontal breadth measurements, are as follows:—

C. mœnas.—Right Dentary Margin.

Carapace length in millimetres.	Average excess of 1895 crabs over 1893 crabs.	
	In thousandths of carapace length.	In millimetres.
10—11	1·39	0·01
11—12	2·09	0·02
12—13	1·87	0·02
13—14	1·56	0·02
14—15	1·42	0·02

As these results seemed to indicate that a change in regard to these dimensions was taking place in the species, it was desirable to compare similar measurements in the adult. Fortunately Professor Weldon was able to supply me with 254 specimens of male *C. mœnas* with a carapace length ranging between 40 and 63 mm., taken at Plymouth at random in 1892–3: and for comparison he procured 496 individuals collected at Plymouth in January of the present year and corresponding in size.

Measurements similar to those made on the young ones gave the following results:—In frontal breadth the 1892–3 crabs exceeded the 1896 crabs on an average by 8·85 thousandths of their carapace length, which for an average length of 50 mm. is equivalent to 0·44 mm., while in the right dentary margin the 1896 crabs exceeded those of 1892–3 on an average by 3·1 thousandths, or an equivalent of 0·16 mm., thus fully confirming the results arrived at in the young ones.

Whether these results indicate a permanent change in the species at Plymouth in respect to these particular dimensions of the carapace, tending to the establishment of a new variety, or whether it is a mere oscillation such as, for all we know, may be constantly going on in the relative dimensions of the various parts of the members of all species, can only be decided by further measurements, which, it is hoped, may be continued on the same species after another interval of two or three years. Meanwhile, the persistence with which the same tendency asserts itself in the twenty-six groups into which we have divided these crabs of 1892–3 and 1895–6 is remarkable, and may perhaps induce others to take measurements of other animals at definite intervals, and establish similar comparisons.

I wish to add my hearty thanks to Professor Weldon for suggesting the line of investigation and furnishing material and ever-ready help.

Table I.

Mean length.	1893—(3077 ♂).					1895—(1957 ♂).				
	Number of animals.	Frontal breadth.		Right dentary margin.		Number of animals.	Frontal breadth.		Right dentary margin.	
		Arithmetic mean.	Mean error.	Arithmetic mean.	Mean error.		Arithmetic mean.	Mean error.	Arithmetic mean.	Mean error.
10·1	72	816·17	9·75	413·25	8·96	53	809·08	9·77	414·45	11·36
10·3	87	812·06	11·90	414·87	8·92	62	804·82	9·99	416·36	10·18
10·5	107	807·37	10·79	418·87	9·41	79	803·27	9·83	417·70	8·39
10·7	143	808·96	10·14	417·11	9·56	64	801·69	8·64	421·06	9·18
10·9	145	805·07	10·13	419·00	8·41	66	799·27	9·70	420·49	7·80
11·1	169	802·50	11·34	420·28	9·17	92	794·12	8·10	424·17	8·80
11·3	178	798·18	10·11	422·45	9·71	79	792·38	7·92	423·27	9·35
11·5	161	797·19	10·26	421·94	9·14	85	788·83	8·08	424·06	9·00
11·7	167	794·28	11·10	423·92	9·25	79	785·29	7·39	425·61	9·69
11·9	146	791·45	10·82	426 18	8·25	107	786·53	8·13	428·12	9 67
12·1	149	788·38	10·58	427·10	8·17	101	780·61	8·92	429·67	7·46
12·3	159	783·98	10·56	427·57	8·76	94	779·50	9·20	428·44	8·49
12·5	158	783·99	10·80	428·87	9·16	111	776·50	7·85	430·02	7·95
12·7	117	783·58	11·45	430·29	9·88	105	773·43	8·44	432·91	8·73
12·9	130	777·38	9·95	432·23	8·13	98	773·63	8·43	434·40	8·77
13·1	109	776·63	9·84	432·05	9·96	90	771·61	8·04	432·50	10·30
13·3	96	774·60	11·20	434·71	9·54	76	766·21	8·22	436·47	9·02
13·5	114	766·91	12·21	434·85	8·68	79	763·96	7·85	435·86	8·08
13·7	119	767·63	11·82	436·24	9·90	98	762·00	8·57	438·68	9·58
13·9	98	763·73	12·20	438·48	8·74	77	759·40	8·15	440·64	8·90
14·1	98	758·94	12·65	440·52	8·82	67	757·00	8·06	440·58	9·62
14·3	99	756·90	11·73	440·74	10·70	69	755·77	9·19	441·64	7·11
14·5	83	762·60	11·86	440·86	9·93	55	754·45	7·40	443·73	10·43
14·7	85	753·00	11·36	443·41	9·68	37	749·84	8·59	447·41	10·19
14·9	88	751·32	10·91	444·73	9·64	34	748·03	7·27	444·00	8·09
Adult	254	600·45	15·00	496·55	11·90	496	591·60	12·75	499·65	10·85

Note.—The arithmetic means are expressed in terms of the carapace length, which is here taken as = 1000.